

We claim:

1. A method of electrochemical mechanical processing of a conductive face of a wafer using a process solution, an electrode and a compressible pad having a polishing surface and a backside, the method comprising:
  - touching the conductive face with the polishing surface of the compressible pad;
  - increasing the pressure between the polishing surface and the conductive face near the center of the conductive face; and
  - processing the conductive face while maintaining a potential difference between the conductive face and the electrode.
2. The method of Claim 1, further comprising the step of maintaining a relative motion between the wafer and the compressible pad.
3. The method of Claim 2, wherein the relative motion between the wafer and the compressible pad is smallest near the center of the conductive face.
4. The method of Claim 1, wherein the step of increasing the pressure near the center of the conductive face comprises shaping the wafer so that the center of the conductive face is pressed against the polishing surface with more force than the rest of the conductive face.
5. The method of Claim 1, wherein the step of increasing the pressure near the center of the conductive face comprises shaping the pad so that the polishing surface applies more pressure to the center of the conductive face than to the rest of the conductive face.
6. The method of Claim 4, wherein the shaping the wafer is provided by applying a force to the center of a back face of the wafer.
7. The method of Claim 6, wherein the force is applied by an inflatable membrane.
8. The method of Claim 6, wherein the force is applied by pushing at least one pin.

9. The method of Claim 6, wherein the force is applied by placing a curved surface onto the back face of the wafer.
10. The method of Claim 5, wherein shaping the pad is provided by applying a force onto the backside of the compressible pad.
11. The method of Claim 10, wherein the force is applied by exerting liquid pressure onto the backside of the compressible pad.
12. The method of Claim 10, wherein the force is applied as the process solution flows through the compressible pad.
13. The method of Claim 12, further comprising controlling the force by controlling the liquid pressure.
14. The method of Claim 12, further comprising the step of controlling the flow rate of the process solution to adjust the force applied to the backside of the compressible pad.
15. The method of Claim 1, wherein the step of processing comprises electrochemical mechanical deposition.
16. The method of Claim 1, wherein the step of processing comprises electrochemical mechanical polishing.
17. A system for electrochemical mechanical processing of a conductive face of a wafer using a process solution, comprising:
  - a compressible pad having a polishing surface;
  - a shaping mechanism configured to push the conductive face against the polishing surface with more force at the center of the conductive face than the rest of the conductive face; and
  - an electrode for applying a potential difference between the electrode and the conductive face as both the conductive face and the electrode are wetted by the process solution.

18. The system of Claim 17, further comprising a moving mechanism configured to provide relative motion between the conductive face and the polishing surface during the process.
19. The system of Claim 17, wherein the shaping mechanism applies pressure on a back face of the wafer to push the center of the conductive face against the polishing surface with more force than the rest of the conductive face.
20. The system of Claim 19, wherein the shaping mechanism is a convex surface that is pressed on the back face of the wafer.
21. The system of Claim 19, wherein the shaping mechanism is at least one movable pin that is placed on the back face of the wafer.
22. The system of Claim 19, wherein the shaping mechanism is an inflatable membrane exerting pressure on the back face of the wafer.
23. The system of Claim 17, further comprising a wafer holder to retain the wafer.
24. The system of Claim 23, wherein the pressure mechanism is a part of the wafer holder.
25. The system of Claim 24, wherein the shaping mechanism applies pressure on a back face of the wafer to push the center of the conductive face against the polishing surface with more force than the rest of the conductive face.
26. The system of Claim 25, wherein the pressure mechanism is a convex surface that is pressed on the back face of the wafer.
27. The system of Claim 25, wherein the pressure mechanism is at least one movable pin that is placed on the back face of the wafer.
28. The system of Claim 25, wherein the pressure mechanism is an inflatable membrane exerting pressure on the back face of the wafer.

29. The system of Claim 17, wherein electrochemical mechanical processing comprises electrochemical mechanical deposition.
30. The system of Claim 17, wherein electrochemical mechanical processing comprises electrochemical mechanical polishing.
31. A system for electrochemical mechanical processing of a conductive face of a wafer using a process solution, comprising:
- a wafer carrier holding the wafer;
  - a solution chamber to hold the process solution, the solution chamber having an upper opening; and
  - a compressible and flexible pad, having a polishing surface and fluid channels, placed between the upper opening of the solution chamber and the conductive face of the wafer, wherein the compressible and flexible pad is configured to bow and apply more pressure near the center of the conductive face than the rest of the conductive face as the pressure of the process solution in the solution chamber increases.
32. The system of Claim 31, further comprising a perforated and flexible support plate placed under the compressible and flexible pad.
33. The system of Claim 31, further comprising a porous membrane placed under the compressible and flexible pad.
34. The system of Claim 32, wherein a porous membrane is placed under the perforated and flexible support plate.
35. The system of Claim 31 further comprising a pressure sensor placed in fluid communication with the process in the process solution chamber.
36. The system of Claim 31, wherein the signal of the pressure sensor is fed to a solution flow controller to adjust flow rate of the process solution.

37. The system of Claim 31, wherein electrochemical mechanical processing comprises electrochemical mechanical deposition.
38. The system of Claim 31, wherein electrochemical mechanical processing comprises electrochemical mechanical polishing.
39. A system for electrochemical mechanical processing of a conductive face of a wafer using a process solution, comprising:
- a wafer carrier holding the wafer;
  - a solution chamber to hold the process solution, the solution chamber having an upper opening defined by extendable side walls; and
  - a compressible pad, having a polishing surface and fluid openings, placed between the upper opening of the solution chamber and the conductive face of the wafer, wherein as the pressure of the process solution increases extendable side walls of the process chamber push the polishing surface against the conductive face and apply uniform pressure on the conductive face.
40. The system of Claim 39, further comprising a perforated support plate placed under the compressible pad.
41. The system of Claim 39, further comprising a porous membrane placed under the compressible pad.
42. The system of Claim 41, wherein a porous membrane is placed under the perforated support plate.
43. The system of Claim 39, wherein electrochemical mechanical processing comprises electrochemical mechanical deposition.
44. The system of Claim 39, wherein electrochemical mechanical processing comprises electrochemical mechanical polishing.
45. A method of electrochemical processing of a conductive face of a wafer using a process solution, an electrode and a plate, which is flexible, having channels, the method comprising:

flowing the process solution through the channels wherein the flow of solution results in shaping the plate into a convex shape having a top region;

wetting a central region of the conductive face with the process solution flowing from the top region of the plate before wetting the rest of the conductive face; and

processing the conductive face while maintaining a potential difference between the conductive face and the electrode.

46. The method of Claim 45 further comprising the step of moving the conductive face towards the plate before the step of wetting.

47. The method of Claim 46, wherein the step of wetting the central region of the conductive face results in removing entrapped gas bubbles from the central region.

48. The method of Claim 45, further comprising rotating the wafer.

49. The method of Claim 45, wherein the step of processing comprises electrochemical deposition.

50. The method of Claim 45, wherein the step of processing comprises electrochemical polishing.

51. The method of Claim 45, wherein a pad is attached onto the plate.

52. The method of Claim 51, wherein the step of processing comprises electrochemical mechanical processing.

53. A method of electrochemical mechanical processing of a conductive face of a wafer using a process solution, an electrode and a pad which is flexible and compressible and having channels extending between a polishing surface and a back surface, the method comprising:

touching the polishing surface with the conductive face

flowing the process solution through the channels wherein the flow of solution results in shaping the pad into a convex shape so that the polishing surface presses near the center of the conductive face with more force than the rest of the conductive face; and

processing the conductive face while maintaining a potential difference between the conductive face and the electrode.

54. The method of Claim 53, wherein flowing of the solution through the channels applies a pressure onto the back surface of the pad.

55. The method of Claim 54, wherein the pressure is controlled by the flow rate of the process solution.

56. The method of Claim 53, further comprising the step of maintaining a relative motion between the wafer and the compressible pad.

57. The method of Claim 53, wherein the step of processing comprises electrochemical mechanical deposition.

58. The method of Claim 53, wherein the step of processing comprises electrochemical mechanical polishing.